National Science Foundation
Directorate for Social, Behavioral, and Economic Sciences (SBE) Advisory Committee
May 23-24, 2016; NSF Headquarters, Stafford I, Room 1235
Meeting Summary

SBE Advisory Committee (AC) Members Present: Dr. Kenneth Bollen, AC Chair, Department of Psychology and Neuroscience and Department of Sociology, University of North Carolina, Chapel Hill; Dr. Joseph Altonji, Economics Department, Yale University; Dr. Karen Cook, Department of Sociology, Stanford University; Dr. Nilanjana Dasgupta, Department of Psychological and Brain Sciences, University of Massachusetts at Amherst; Dr. Ruth DeFries, Department of Ecology, Evolution and Environmental Biology, Columbia University; Dr. Catherine Eckel, Department of Economics, Texas A&M University; Dr. Martha Farah, Center for Neuroscience and Society and Department of Psychology, University of Pennsylvania; Dr. J.W. Harrington, Vice Chancellor for Academic Affairs, University of Washington, Takoma; Dr. Jon Krosnick, Department of Communications, Stanford University; Dr. Arthur Lupia, Department of Political Science, Institute for Social Research, University of Michigan; Dr. Thomas McDade, Department of Anthropology, Northwestern University; Dr. Joanna Morris, School of Cognitive Science, Hampshire College; Dr. William Riley, Office of Behavioral and Social Sciences Research, National Institutes of Health (*Ex officio*); Dr. Linda Smith, Department of Psychological and Brain Sciences, Indiana University; Dr. Lydia Villa-Komaroff, Massachusetts Life Center (Committee on Equal Opportunities in Science and Engineering, CEOSE, liaison).

SBE Advisory Committee Members Absent: Dr. John Gabrieli, McGovern Institute for Brain Research, Massachusetts Institute of Technology.

NSF Staff in Attendance: Dr. Richard Buckius, Chief Operating Officer; Dr. Fay Lomax Cook, Assistant Director (AD), SBE; Dr. Kellina Craig-Henderson, Deputy AD, SBE; Mr. John Gawalt, Division Director, SBE/National Center for Science and Engineering Statistics (SBE/NCSES); Dr. Joydip (JD) Kundu, Acting Deputy Division Director, SBE/NCSES; Dr. Alan Tomkins, Acting Division Director, SBE/Division of Social and Economic Sciences (SBE/SES); Dr. Katherine Meyer, Acting Deputy Division Director, SBE/SES; Dr. Howard Nusbaum, Division Director, SBE/Division of Behavioral and Cognitive Sciences (SBE/BCS); Dr. Tamera Schneider, Acting Deputy Division Director, SBE/BCS; Dr. Deborah Olster, Senior Advisor, SBE/Office of the Assistant Director (OAD); Ms. Madeline Beal, Communications Specialist, SBE/OAD; Mr. Anthony Teolis, SBE Administrative Coordinator, SBE/OAD; Ms. Clarissa Johnson, IT Specialist, SBE/OAD; Mr. Philip Johnson, IT Specialist, SBE/OAD; Dr. James Kurose, AD, Directorate for Computer & Information Science & Engineering (CISE); Dr. James Hamos, Senior Advisor, Office of the Director (OD); Dr. Jessica Rosenberg, American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow, OD; and other NSF staff.

Note: The meeting was open to the public and representatives of stakeholder groups also attended. Guest speakers included Dr. Steven Ruggles, University of Minnesota and Advisory Committee for Advanced Cyberinfrastructure Liaison; Dr. Marcia McNutt, Editor-in-Chief, *Science*, and President-Designate, National Academy of Sciences; and Dr. Kathleen Hall Jamieson, University of Pennsylvania.

Summary: This was the first meeting of the SBE AC in 2016. The agenda included the following items: Updates on the activities of the SBE directorate and its divisions; presentation of ideas developed during SBE's "Visioneering" exercise; presentation and discussion of Grand Challenges for the SBE sciences developed by AC members; a discussion on the future of graduate education in the SBE sciences; presentations and discussions about science communications; a conversation with NSF leadership; a

discussion about collaborations between SBE and CISE; a presentation/discussion of a workshop report on public access to data in the SBE sciences; and planning for future SBE AC meetings. Additional information about the meeting is posted at
http://www.nsf.gov/events/event_summ.jsp?cntn_id=138384&org=NSF.

Welcome, Introductions, Review of the AC Meeting Summary from December, 2015, and Preview of the Agenda (Dr. Kenneth Bollen)
Following introductions, the SBE AC Chair Kenneth Bollen welcomed one new AC member, Dr. Linda Smith, Department of Psychological and Brain Sciences, Indiana University. The AC approved the fall, 2015 AC meeting summary and Dr. Bollen previewed the agenda for the current meeting.

SBE Directorate Update (Dr. Fay Lomax Cook, AD, SBE)
Dr. Cook welcomed the AC and provided an update on the NSF/SBE Fiscal Year (FY) 2016 enacted budget and the President's FY 2017 Budget Request.   The FY 2016 enacted budget for SBE remains flat with FY 2015. The FY 2017 Budget Request calls for a $16.4 million increase for SBE in "mandatory funding", a category of funding outside of the regular appropriations.

Dr. Cook then summarized the directorate's support of research through its core programs and highlighted SBE's growing interest in Robust and Reliable Science, i.e., science that is reproducible, replicable, and generalizable. She also described the directorate's plans to participate in the following cross-directorate initiatives in FY 2017:
- *Understanding the Brain (UtB)*;
- *Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP)*;
- *Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS)*;
- *Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES)*;
- *Secure and Trustworthy Cyberspace (SaTC)*;
- *Smart and Connected Communities (S&CC)*; and
- *Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF 21)*. SBE's primary activity in CIF 21 is *Resource Implementations for Data Intensive Research in the Social Behavioral and Economic Sciences (RIDIR)*.

In addition, in preparation for the FY 2018 Budget Request that will be submitted by the next President, NSF has developed nine "Big Ideas" for future investment:
- *Harnessing Data for 21st Century Science and Engineering*
- *Shaping the New Human – Technology Frontier*
- *Understanding the Rules of Life: Predicting Phenotype*
- *The Quantum Leap: Leading the Next Quantum Revolution*
- *Navigating the New Arctic*
- *Windows on the Universe: The Era of Multi-messenger Astrophysics*
- *Growing Convergent Research at NSF*
- *Mid-scale Research Infrastructure*
- *NSF 2050*

Dr. Cook's update continued with a recap of SBE's recent outreach activities. As part of the FY 2017 NSF Budget Request roll-out, SBE's AD and DAD visited with staff from eight different House, Senate, or

Committee offices. Organized by NSF's Office of Legislative Affairs (OLPA), these Capitol Hill meetings provide an opportunity to communicate SBE's mission and priorities, highlight directorate activities of particular interest to the office being visited, and to encourage the Senator/Representative/staffer to reach out to SBE if they need data or other information. In another form of outreach, SBE has begun a concerted effort to reach out to minority serving institutions through in-person events at institutions in Tennessee and Washington, DC, and through an informational webinar that reached people from 34 different colleges and universities around the country. SBE-funded researchers also participated in the USA Science and Engineering Festival in Washington, DC, in April, 2016. Dr. Cook concluded her presentation by highlighting SBE-funded scientists who have received national recognition and high-profile awards.

The brief discussion after the directorate update focused on the process for developing NSF's "Big Ideas" for future investment, a topic that re-surfaced multiple times throughout the AC meeting.

Division of Behavioral and Cognitive Sciences (BCS) Update (Dr. Howard Nusbaum, DD, BCS)
Dr. Nusbaum began his update with the announcement of personnel changes in BCS, including the departure of BCS Deputy Division Director, Dr. Amber Story, who has left NSF to join the American Psychological Association. He then described BCS support of transformative science, using examples from the Dynamics of Coupled Natural and Human Systems program, and several projects addressing cognition and cognitive neuroscience. He also described a number of BCS-funded workshops on Robust and Reliable science, and the Division's continuing support for the Science of Learning after the graduation of the Science of Learning Centers.

Division of Social and Economic Sciences (SES) Update (Dr. Alan Tomkins, Acting DD, SES)
Dr. Tompkins began his update with SES staff transitions, including the July, 2016 arrival of Dr. Daniel Sui as Division Director and changes in the program director and science assistant staff. He then highlighted two projects as exemplars of SES funding priorities: one on false confessions and a second on the social contagion of gun violence. He also described recent workshops on the Responsible Conduct of Research and on the Science of Science and Innovation Policy. Dr. Tomkins concluded with the announcement of the upcoming meeting of the Committee of Visitors for SES, to be chaired by SBE AC member Dr. Karen Cook.

National Center for Science and Engineering Statistics (NCSES) Update (Mr. John Gawalt, DD, NCSES)
Mr. Gawalt updated the AC on recently published NCSES InfoBriefs and reports on federal funding for research; graduate enrollment in science and engineering; U.S. business innovation; doctorate recipients from U.S. Universities; and others. He did a live demonstration of the new web-based/interactive *Science and Engineering Indicators 2016*, the first digitally-born version of the biennial report. His presentation concluded with a description of various survey and data improvement activities in which NCSES is engaged.

SBE Visioneering: *Humans, Technology, and Society: Complex Interactions Impacting the Future* (Dr. Howard Nusbaum, DD, BCS)
Dr. Nusbaum presented *Humans, Technology, and Society: Complex Interactions Impacting the Future*, an idea developed by the SBE senior leadership as part of a "Visioneering" exercise. The essence of the idea is one of coupled, interactive systems in which humans influence technology and technology, in turn, influences humans. The rapidly changing interactions between humans and the technology we create raise numerous research questions for the SBE sciences, such as: 1) How will new intelligent, autonomous, adaptive devices affect human psychology and society and how will changes in psychology

and society shape the development and use of technology? 2) How do social media and technological developments in communication among people and between people and machines change human psychology and social interaction? 3) How do interactions between intelligent devices that adapt dynamically to people change the "psychology" of devices? and 4) How do new scientific discoveries in cognitive neuroscience change the way technology functions? Dr. Nusbaum also described the importance and timeliness of research on this topic and its potential to capture the imagination of the public and other stakeholders in the science enterprise.

The AC was enthusiastic about this topic and suggested that SBE: 1) broaden the concept of "technology" beyond gadgets and devices to include advances such as genetic engineering, which could, for example, revolutionize agriculture; and 2) consider the ethical, legal, and social implications of new technologies, areas ripe for research in the SBE sciences. In addition, AC members mentioned the need to change graduate education to prepare SBE scientists to work in this area, and questioned how NSF would implement this vision and garner support for it from the public and the Congress. SBE leadership noted that SBE's concept on human-technology interactions has been incorporated into a multi-directorate "Big Idea", *Shaping the New Human-Technology Frontier*.

SBE Visioneering: *Work and Productivity in the 21st Century* (Dr. Fay Lomax Cook, AD, SBE)
Dr. Cook presented a second product of SBE Visioneering: *Work and Productivity in the 21st Century*. This idea focuses on the changing nature of work, which includes who works, how, when, and where work is done, and the type of work that is done. Within this idea, SBE researchers might explore persistent employment inequalities; the mechanisms underlying "non-cognitive" skills such as persistence, diligence, resourcefulness and resilience, and social skills such as cooperation and empathy; development of tools to track the workforce and labor productivity in the "on-demand" economy; and the impact of demographic and technological changes on work, productivity and global competitiveness. Dr. Cook described the timeliness and urgency of this research vision. The timeliness arises from advances in modeling techniques, the availability of better datasets (e.g., longitudinal tracking of students through the educational pipeline into the workforce), and the ability to combine experimental, survey, and administrative data to enable the development of integrative models that describe how multiple factors, at many levels of analysis, interact to influence work and productivity. The urgency derives from the fact that the Nation is experiencing a slowing in productivity gains, accompanied by angst that this signals a decline in innovation.

The ensuing discussion with the AC touched on a number of topics, including broadening this concept to encompass other scientific disciplines, and how best to communicate this research vision when the payoff will be long-term. AC members noted the importance of research on work and productivity to U.S. economic competitiveness and security, and to combatting inequalities.

SBE AC Grand Challenges
Several AC members presented their ideas for Grand Challenges in the SBE sciences. One idea was *Childhood Poverty*, and a related one was *The Neuroscience of Socioeconomic Status,* an effort to explore the neural mechanisms by which poverty compromises life chances. Discussion of these ideas centered on how best to communicate them and the scientific opportunities (data availability; neuroimaging methodologies; computational capabilities) that make these topics tractable in ways that were not previously possible.

Also suggested as Grand Challenges were *A Unified View of Learning* (that would combine what we know about machine learning, brain mechanisms and anatomy underlying learning, and learning by

children and adults to improve learning in humans and in machines), and *Income Inequalities.* The latter could encompass research that explores 1) the causes of income inequalities at the macroeconomic, family systems, and individual levels; 2) objective and subjective experiences of class; 3) the permeability of income inequality; 4) when low socioeconomic status is most impactful; and 5) the downstream consequences of income inequalities. The final Grand Challenge proposed was *WEIRD Science*. *WEIRD Science* refers to research with human subjects who are overwhelmingly western, educated, and from industrialized, rich and democratic countries, and therefore not representative of the overall human population. The continued use of these subjects in research studies presents significant problems with generalizability of findings.

The remainder of the AC discussion during this session focused on the other "Big Ideas" put forth by the NSF. There was general agreement that SBE sciences should be included in *Harnessing Data for 21st Century Science and Engineering*; *Understanding the Rules of Life: Predicting Phenotype*; *Navigating the New Arctic*; and *Shaping the New Human-Technology Frontier*.

Graduate Education in the SBE Sciences (Discussion moderated by Dr. Joseph Altonji, SBE AC member)
Dr. Joseph Altonji began with a summary of the discussion of graduate education from the Fall, 2015 SBE AC meeting. At that time, Dr. Ferrini-Mundy, AD, Directorate for Education and Human Resources, posed two questions: 1) How should graduate education change for disciplines within the SBE sciences? and 2) What do you want to understand better about graduate education?

AC members identified several aspects of SBE graduate education in need of improvement: training in statistics and computational methods; development of communication skills to give students the tools they need to translate their research and relate it to the needs of society; interdisciplinary research training; and training to work in teams. They also recommended the use of internships or other applied training experiences; separate tracks for varying career paths; and decreasing the time to degree for those students pursuing non-academic careers. The AC suggested that NSF explore modifying its graduate education support mechanisms to incorporate these alternative career paths, perhaps by providing supplemental funds for students to gain work experience outside academia or by funding one university to act as a clearinghouse to match graduate students with potential employers.

In response to several questions about the demographics of current graduate students, Dr. Cook provided relevant data from NCSES. Unemployment among PhD recipients in the SBE sciences is below 2%, less than that among doctorates in engineering and other sciences. The number of doctorate degrees conferred in all SBE disciplines has increased between 1959 and 2013, and SBE PhD recipients are employed across various sectors: education, for-profit entities, self-employed, non-profit organizations, and government. The median time to degree ranges from approximately seven years in psychology and economics to nine years in all other social science disciplines. At 7.7 years, the median time to PhD across all SBE disciplines remains higher than that found in other scientific disciplines but lower than that reported in the humanities.

Additional issues of concern noted by the AC include the uncertainty that many graduate students face when choosing to begin a program, the time to degree, the funding, and the career paths that will be available when they graduate. This uncertainty can be especially hard on women and individuals from underrepresented minority groups. Also mentioned was the need to reconcile or expand traditional measures of success of graduate programs (e.g., post-PhD employment at PhD-granting institutions) in light of efforts to prepare students for non-academic careers. Several members suggested stronger

engagement with industries that are hiring social scientists to align graduate training with the desired skill sets, and the joint funding of graduate education by industry and government.

In response to Dr. Ferrini-Mundy's second question (What do you want to understand better about graduate education?), AC members noted a need for more data and knowledge about the varying needs of employers outside academia, and on the outcomes of NSF graduate training activities. The AC also discussed the possibility of a conference on the future of graduate education in the SBE sciences, which is under consideration by the Social and Behavioral Sciences Subcommittee of the Office of Science and Technology Policy/National Science and Technology Council (OSTP/NSTC), co-chaired by Drs. Fay Cook, Bill Riley (National Institutes of Health and SBE AC member), and Kei Koizumi (OSTP).

Science Communications
***Science* Retrospective (Marcia McNutt, Editor-in-Chief, *Science*, and President-Designate, National Academy of Sciences)**
Dr. McNutt began her presentation by describing the re-design of *Science* that occurred under her leadership. The journal's first issue in the new format focused on the social science of inequality. She then reviewed numerous other examples of SBE research featured in *Science* and the recently launched, open-access *Science Advances*.

She then discussed *Science's* activities related to scientific replicability, including development of the Transparency and Openness Promotion (TOP) guidelines, crafted in collaboration with the Center for Open Science. There are eight standards for which signatories can indicate the level of stringency required: 1) citation standards; 2) data transparency; 3) analytic methods transparency; 4) research materials transparency; 5) design and analysis transparency; 6) pre-registration of studies; 7) pre-registration of analysis plans; and 8) replication. Many leading journals and scientific organizations have signed on to follow the TOP standards.

Related to scientific replicability is the importance of data sharing. Dr. McNutt noted the need for increased funding for data repositories, support for data professionals, and education in data quality and control. She also articulated the need of the various scientific communities needs to come together to establish metadata standards and initiate a culture change wherein data are treated as citable objects, rather than things to be owned.

Following Dr. McNutt's presentation, there was discussion with the AC about the protection of personally identifiable information; the fact that data-sharing does not guarantee replicability; the reluctance of certain SBE scientific societies to sign on to the TOP guidelines; and disagreement about what constitutes important or interesting questions.

The Role of the Social and Behavioral Sciences in Communicating Science (Kathleen Hall Jamieson, Elizabeth Ware Packard Professor of Communication, Annenberg School for Communication, and Walter and Leonore Annenberg Director, Annenberg Public Policy Center, University of Pennsylvania)
In her presentation, Dr. Jamieson posited that the SBE sciences need to play an important role in communication *about* science in addition to communicating the results of specific SBE research projects. SBE scientists need to argue to the values of people across ideological divides, show them what life would be like without basic research, and then also communicate the value of discovery in its own right. The common narratives around science, e.g., the individual who goes against the scientific consensus and is eventually vindicated, also need to be expanded. Science needs new narratives that are broad

enough to encompass the disputes, focusing on science as a self-corrective process of discovery protected by adherence to scientific norms. Retractions of scientific papers are evidence of the self-corrective nature of science, and should be presented and perceived as such, rather than as evidence of scientific fraud.

Dr. Jamieson described how the SBE sciences have a great deal to contribute to communicating about science because they produce the knowledge that can be used to overcome selective exposure, innumeracy, false causal attribution, and the challenges of communicating uncertainty. SBE research results can inform the presentation of new science stories and frames, relying on credibility of sources, graphical representations of data, and showing iterative full trends that overcome end-point bias. She showed evidence that the public will process scientific information better if we can increase their motivation to do so and use accessible, credible data.

In the discussion following the presentation AC members noted the mismatch between people's preference for fast, single-factor explanations and the scientific process-driven narratives presented by scientists. Discussion on the topic of retraction centered on setting expectations ahead of time and communicating them to meet standards regarding transparency, openness, and reproducibility. It was noted that this may initially result in more papers being withdrawn, retracted, or corrected, but that over time, a new, better-trained generation of investigators will emerge. Eventually retractions will decline and return to being rare events.

General Discussion
The general discussion focused on how best to communicate more proactively with Congress. Suggestions to do so included more personal engagement to make the sciences more relevant for Congressional members' and their constituents, and bringing additional allies, e.g., from the business community and the military, to the table to present the value of basic research in the SBE sciences. Discussion then moved to examples of what would be lost without SBE sciences, which included kidney exchange networks, million word studies, and game theory applications. AC members suggested that a greater emphasis on showing how knowledge from SBE research can improve policy decision-making is needed. It was also noted that the SBE communities can provide evidence relevant to pressing societal matters such as the minimum wage, provide meta-analyses, and indicate what is or is not known, without endorsing a particular viewpoint or candidate.

Meeting with NSF Leadership, Dr. Richard Buckius, NSF Chief Operating Officer
Dr. Buckius welcomed and thanked the AC members for their service. The first topic discussed was the budget and the potential for Congress to pursue increased control of future NSF appropriations at the directorate level. Dr. Buckius encouraged all AC members and scholars to take advantage of any opportunity to present information to decision makers to highlight the benefits of basic research in general and the importance of the SBE sciences in particular.

There was a lengthy discussion on industry's hunger to hire social scientists, indicative of the private sector's recognition that, in the information environment, technological and engineering developments can only be fully realized if people accept them. The value of the SBE sciences is also reflected in the strong behavioral components inherent in NSF's "Big Ideas" for future investment. Other topics of discussion were the *Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES)* program; the U.S. falling behind other countries in terms of social science data infrastructure; NSF management of interdisciplinary research; experiments in rolling submission of proposals; and the Foundation's move to Alexandria, Virginia.

Cyberinfrastructure: Current and Future Collaborations between SBE and the Directorate for Computer & Information Science & Engineering (CISE; Dr. James Kurose, AD, CISE)

Dr. Kurose began his presentation with an overview of the big data and data science programs at NSF. These fall into four main areas: foundational research programs; education and workforce development, cyberinfrastructure investments in national computing resources; and community building. Above these initiatives sits NSF's Public Access Plan which supports clear and open communication of research results as central to the progress of science.

CISE supports a comprehensive research cyberinfrastructure ecosystem encompassing people and communities, organizations, computational resources, software, data, networking/cybersecurity, and scientific instruments. This ecosystem serves all of science and engineering, providing access to a diverse array of computational resources, including supercomputers (Blue Waters, Stampede, Comet, and others) and XSEDE (Extreme Science and Engineering Discovery Environment) that connect people, services, and resources.

Dr. Kurose then described *Harnessing the Data Revolution for 21st Century Science and Engineering.* This "Big Idea" involves fundamental research in math, statistics, and computer and computational sciences, and fundamental research on topics such as data discovery, machine learning, reproducibility, and human-data interfaces. Aligned with this is engagement across all NSF-supported research domains to innovate in a robust, comprehensive, and open cyberinfrastructure ecosystem. Another NSF "Big Idea", *Shaping the New Human-Technology Frontier,* envisions the pervasive, personal transformation of computing - the sociotechnical ecosystem that will be a natural extension of human society.

He then described several current, joint CISE/SBE solicitations and programs, including BIGDATA, CIF21, and the National Robotics Initiative. The two directorates have also jointly issued Dear Colleague Letters, such as *Research on Privacy in Today's Networked World* and *Secure and Trustworthy Cyberspace EAGERs Enabling New Collaborations between Computer and Social Scientists*. CISE and SBE can deepen the collaboration by tackling the development of and analytics for multi-modal, longitudinal data sets of human behavior, as well as working to solve larger socio-technical questions regarding cybersecurity and privacy.

The AC members had questions about developing data science curricula and integrating them into SBE disciplines, and the training of faculty in data science. Dr. Kurose suggested that in the future, more junior faculty will have data science expertise that they can incorporate into their teaching. The discussion with the AC also addressed privately-held data and data privacy and its implications for the SBE sciences. Dr. Kurose noted that a national R&D strategic plan on data privacy is forthcoming from the Networking and Information Technology Research and Development (NITRD) agencies and that the Computing Community Consortium is holding four workshops on aspects of data privacy. CISE and SBE are also supporting a U.S.-Netherlands collaboration on data privacy. The discussion also touched on the topic of new collaborations and the need for longer term investments to support the formation of new fields, beyond the common two- to three-year NSF award timeframes.

Transparency and Accountability of NSF Award Titles and Abstracts (Drs. James Hamos, Senior Advisor, and Jessica Rosenberg, AAAS Science and Technology Policy Fellow, Office of the Director)

Dr. Hamos described NSF's Transparency and Accountability activities that include issuance of external "Important Notices" and development of internal policy and guidance documents. Additionally, in April, 2015, the National Science Board issued a resolution affirming NSF activities on Transparency and

Accountability. Much of the activity so far has focused on improving the abstracts and titles of NSF awards, an effort that recognizes the general public as a primary audience for award abstracts. Abstracts are now written to explain the work's significance and to justify NSF funding of the project. Program officers are responsible for writing abstracts, although they usually do so in consultation with Principal Investigators (PIs).

Dr. Rosenberg showed the results of NSF's preliminary analysis of how award titles and abstracts have changed since the introduction of new Transparency and Accountability policies and guidance. Across the Foundation and including SBE, the percentage of titles that have been changed between proposal submission and award has increased since the new policies and guidance were developed. The clarity of titles, too, has improved, and is rated higher in SBE awards than in NSF awards as a whole. Readability analyses indicate that abstracts of 2015 NSF awards (including SBE awards) were written at an average reading level of grade 18/19. This was true for both the technical and non-technical components of the abstract. Science articles in *The New York Times*, by comparison, are written at a 12th grade level. An analysis of word themes showed the non-technical sections of abstracts contain fewer technical terms than the technical sections. Overall, the preliminary analysis indicates that titles and abstracts are improving, but that additional work remains to be done.

The discussion following the presentation included the suggestion that future analyses use members of the target audience, e.g., members of the lay public, to assess award abstracts and titles, rather than NSF staff, as has been done thus far. It was also acknowledged that abstracts and titles have multiple target audiences and goals. Abstracts and titles must be understandable and also convey the importance of the project and its scientific merit. Broader impacts of a project may be more important to the general public and to Congress, while scientific merit may resonate more with the scientific community. NSF should train program officers to write to these targets so that they can better guide PIs.

Public Access to SBE Data (Dr. Steven Ruggles, University of Minnesota; Advisory Committee for Cyberinfrastructure Liaison)
Dr. Ruggles reported on a January, 2016 workshop aimed at improving implementation of NSF's Data Management Plan (DMP) policy as it applies to the SBE sciences. The workshop participants addressed multiple questions: 1) What is data and why share them? 2) What is the proper scope of a DMP and to what kind of data does it apply? 3) What are the ethical issues that must be considered in sharing sensitive data? 4) What are the logistics to enable data sharing? And 5) Once a DMP is developed, who implements it, pays for it, enforces it, etc.?

The workshop discussions produced recommendations for Principal Investigators (PIs), panelists and reviewers, and NSF program staff. Additional recommendations addressed research needs and NSF policy and practice. Workshop participants recommended that PIs be instructed that data sharing is a key aspect of the evaluation of Broader Impacts of proposals, including the evaluation of the results of prior support. DMP norms should be that data are thoroughly documented, shared with the research community as soon as possible, and deposited in a responsible digital repository as soon as they are available to the PI, even if there is an embargo period. Deviation from these norms should be explained. DMPs should specify what data will be shared; how, when, and where data will be preserved and shared; restrictions on data access; maintenance of access after the project ends; and the outcome of previous DMPs.

Recommendations for panelists and reviewers are that they discuss data sharing as part of their evaluation of Broader Impacts; take into account publications and data sharing from prior research;

evaluate proposal DMPs as adequate or inadequate and provide feedback; and not recommend proposals with inadequate DMPs for the most competitive funding category. The workshop participants recommended that NSF program staff ensure that panelists/reviewers have appropriate expertise to evaluate DMPs and that they discuss them and provide feedback to PIs in reviews. In addition, program staff should ensure compliance with the DMP with an explicit check-off on the final report.

Recommendations for SBE and NSF included the following: SBE should fund research about DMPs and their results, and should support training in data management and the development of tools and facilities for sustainable data sharing, including removing barriers to sharing confidential/sensitive data. NSF and SBE should work with major data repositories to ensure that PIs can be compliant with the NSF Public Access Policy. NSF should make DMPs of funded projects public on the NSF website along with their project summaries; should update annual and final reports so that there is a place to report Digital Object Identifiers (DOIs) for data alongside other outputs resulting from each grant; and reach out to other federal agencies to coordinate expectations about data sharing, management, and protection of human subjects.

The ensuing discussion touched on a number of issues: building the costs of data sharing into proposal budgets or as award supplements, perhaps to be paid for out of a separate pool of funds so as not to compete with basic research funding; Institutional Review Board (IRB) issues; PI burden to make data shareable; data available for purchase, but not necessarily permissible to share; updating of data-sharing activities in award final reports after the award has ended; sharing longitudinal data; automatic extensions on DMPs when awards are in no-cost extensions; and drafting principles that will guide data sharing when precise plans are not known at the time the DMP is drafted (and modifying DMPs over the course of the award). Additional discussion focused on data confidentiality and sensitivity and recommended data repositories.

Future Meetings, Assignments, and Concluding Remarks (Kenneth Bollen, SBE AC Chair and Fay Lomax Cook, AD, SBE)

The next SBE AC meeting is scheduled for October 27-28, 2016 at NSF Headquarters in Arlington, VA. The Committee of Visitors (COV) for SES is expected to report at that meeting, followed by the SBE/SES response to the COV report. Potential additional agenda topics include: SBE's role in NSF's "Big Ideas" for future investments; causal inference and how to derive meaning from linking datasets; and continued discussion on science communications. AC members were encouraged to send suggestions for additional agenda items.

The meeting was adjourned at 12:50 p.m.